The impact of cooperative learning on the achievement, interest and motivation of year five students*

El impacto del aprendizaje cooperativo en el logro, interés y motivación de los estudiantes de quinto año

Md Yusoff Daud[1]
Universiti Kebangsaan Malaysia - Malaysia
mdyusoffdaud@ukm.edu.my

Azizul Shah Abdul Rahman[2]
Universiti Kebangsaan Malaysia - Malaysia

ABSTRACT

The aim of the research is to determine to what extent does cooperative learning could improve students achievement in the topic of fraction in mathematics, among year five students. In addition, the second aim of the study is to what extent does cooperative learning impressed student's interest and motivation in learning the topic. Jigsaw structures cooperative learning is used in as the teaching learning approach. This study involves a sample of 60 students of year five from Primary School in the Subang Jaya, Selangor, who are categorised under middle and low achievers in mathematics. The study employed Quasi-Experimental, in which 30 students were exposed to cooperative learning (jigsaw) and the rest were exposed to traditional learning. Pre and post tests are used to determine the stage of improvement and achievement. A set of questionnaires were used to determine the interests and motivation of students towards cooperative learning. A set of statements in relation to the experience of being in the cooperative classroom were used to assess the perceptions of the students in learning. Data were analyzed by using SPSS Version 18. Research finding showed an increment scores mean achievement among the cooperative learners compared to the traditional learners. The study also showed that attitudes and positive motivation significantly related to cooperative learning. Hence, the perception of students from cooperative classroom are positive and they enjoyed studying fractions and believed that it was easy to understand. Finally, cooperative learning approach should be used as a platform to dominate the learning process in schools in order to build a world-class education level

Keywords: Cooperative learning, Achievement, Interest, Motivation, Teaching and Learning.

RESUMEN

El objetivo de la investigación es determinar en qué medida el aprendizaje cooperativo podría mejorar el rendimiento de los estudiantes en el tema de fracción en matemáticas, entre los estudiantes de quinto año. Además, el segundo objetivo del estudio es en qué medida el aprendizaje cooperativo impresionó el interés y la motivación del alumno por aprender el tema. El aprendizaje cooperativo de estructuras de rompecabezas se utiliza como enfoque de enseñanza aprendizaje. Este estudio involucra una muestra de 60 estudiantes de quinto año de la escuela primaria en Subang Jaya, Selangor, que se clasifican en estudiantes de nivel medio y bajo en matemáticas. El estudio empleó Cuasi-Experimental, en el que 30 estudiantes estuvieron expuestos al aprendizaje cooperativo (rompecabezas) y el resto al aprendizaje tradicional. Las pruebas previas y posteriores se utilizan para determinar la etapa de mejora y logro. Se utilizó un conjunto de cuestionarios para determinar los intereses y la motivación de los estudiantes hacia el aprendizaje cooperativo. Se utilizó un conjunto de declaraciones en relación con la experiencia de estar en el aula cooperativa para evaluar las percepciones de los estudiantes en el aprendizaje. Los datos se analizaron utilizando SPSS Versión 18. El resultado de la investigación mostró un puntaje de incremento en el rendimiento medio entre los estudiantes cooperativos en comparación con los estudiantes tradicionales. El estudio también mostró que las actitudes y la motivación positiva se relacionaban significativamente con el aprendizaje cooperativo. Por lo tanto, la percepción de los estudiantes del aula cooperativa es positiva y disfrutaron estudiar fracciones y creyeron que era fácil de entender. Finalmente, el enfoque de aprendizaje cooperativo debe usarse como una plataforma para dominar el proceso de aprendizaje en las escuelas con el fin de construir un nivel educativo de clase mundial

Palabras clave: aprendizaje cooperativo, logro, interés, motivación, enseñanza y aprendizaje.

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1 Corresponding author. Faculty of Education, Centre of Innovation in Teaching and Learning, Universiti Kebangsaan Malaysia, Bangi, Malaysia
2 Faculty of Education, Universiti Kebangsaan Malaysia, Bangi, Malaysia

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1. INTRODUCTION

In the context of education in Malaysia, learning in groups is not something new (Hossain et al., 2012). It is one of the teaching and learning strategies of the New Primary School Curriculum (KBSR) and the Primary School Standard Curriculum (KSSR) created in 2010. This approach is also commonly used by mathematic teachers, but it is not carefully planned. Students are usually grouped in small groups and then distributed the to-do list to be discussed. This procedure is less productive. According to Slavin (2011), cooperative learning is different from ordinary group work. Students in cooperative groups have interpersonal structures, have a defined role, to assist and share responsibilities within the group. Cooperative learning also gives students the opportunity to approach problems in various ways. According to Noraini (2005), if students cooperate in sharing opinions, formulate explanations and give meaning to one's ideas, they will be more confident and problems will be resolved in many ways. She also said studies show that the cooperative learning, the tendency of students to learn mathematics is higher and the level of motivation within them is better. Basically, cooperative learning involves students working together in achieving the objectives of learning (Slavin, 2011). The effectiveness of cooperative teaching and learning is a good solution to ensure the effectiveness and excitement of learning among students.

1.1 Problem Statement

For some students, mathematic is a difficult subject to understand. Teaching strategies and methods should be diversified to address these problems. According to Rahim (2000), the teacher only describes the concept and illustrates how one question or problem is solved. Meanwhile, the students only listen and follow the instructions. It is found that this method is less encouraging interest and motivation among students. The process of teaching and learning is a situation involving both parties, namely teachers and students. According to Kaur (1997), students showed significant weaknesses in the problem solving process, namely at the planning stage, implementing strategies and getting answers. Problem solving should be taken into account when carrying out the teaching process, by changing the teaching style in the form of rote to the interaction. According to Othman et al.,(2012), Zakaria (2003), in mathematics, problem solving lessons can be individually or interactively in groups. A cooperative approach that emphasizes interaction within a group is one of the ways to address the problems that arise.

1.2 The purpose and objective of the study

The purpose of this study is to look at the impact of cooperative learning on the achievement, interest and motivation of the Year 5 students in learning topic fractional at Primary School, in the Subang Jaya, Selangor. This study focuses on fractional topics, a topic that is difficult to understand by primary school students. Fractions are recognized to be a difficult topic in school-mathematics due to the written form of the fractions being comparatively complicated. Fractions are used less in daily life and are less easily described than natural numbers (Haliza et al., 2012) In addition, this study also aims to determine the perceptions of vulnerable students with a cooperative learning approach in the classroom towards learning. The objectives of the study are:

a) To identify the effect of cooperative learning (experimental group) and traditional learning (control group) towards student achievement

b) To identify the effect of cooperative learning (experimental group) and traditional learning (control group) towards student interest

c) To identify the effect of cooperative learning (experimental group) and traditional learning (control group) towards student motivation

d) To analyze the perceptions of cooperative group (experimental group) students on cooperative learning

2. RESEARCH METHODOLOGY

This study uses the Quasi-Experiment design. Researchers did not make restructuring of the classes. Experimental and control groups are formed from existing students in their respective classes and have an achievable level of achievement based on the last monthly test. Both groups were given pre-test aimed at studying the existing knowledge of students on fractional topics. After being given pre-test, the answers collected were analyzed to identify the level of mastery. The researchers made observations for five weeks in the classroom of the experimental group taught. At the end of week 5, students were given a post-test and questionnaires involving all students in the class of experimental and control groups. Results of the study between the two groups were reviewed and analyzed using the SPSS Version 18 Software. All contents of the post-test questions are the same as the content of the pre-test questions with different order sequences of questions. A set of pre and post test questions has been referred to a field expert to verify the content. To measure interest, a set of statements containing 10 items were used. Likewise, to measure motivation, a set of 10 item statements was used. Five-point Likert rating scale was used. Students were given the option to select scale 1 for 'Strongly Disagree', 2 for 'Disagree', 3 for 'Less Agree', 4 for 'Agree', and 5 for 'Strongly Agree'. In addition, the perceptions of students in the cooperative group were analyzed in relation to their experience while in a cooperative group based on the ten statements given. The questionnaire instrument used has been modified and conducted pilot studies on a group of students from the same population who were not involved in the study. The results of the pilot study have shown that the value of item reliability is $\alpha = 0.859$.

The sample of the study consisted of two students from two classes consisting of 60 students. A class was created as an experimental group and another class was used as a control group class. Determination of the experimental class and

the control class were created randomly. Experimental class and control class have the same number of students, a total of 30 students. Students who participated in this study classes and regular school timetables that have been set. Students included in the experimental group and this control group are comprised of groups of students who have similar achievements and interest in the subject matching.

3. RESEARCH FINDING

3.1. Respondents Demographics

The study involved 60 Year Five students at a primary school in the Subang Jaya, Selangor, comprising of two groups which is an experimental group consisting of 30 pupils and a control group consist of 30 pupils. Both groups of these students which have the same background. These students have the same ability in term of interest in subject such as malay language, mathematics and english Table 1 shows the respondent's demographics of the experimental group and the control group.

Table 1. Respondents' demographics

Experimental Group	**Category**	**Frequency**	**Percentage (%)**
Gender	Male	15	50.0
	Female	15	50.0
Interest in Subject	Malay Language	11	36.7
	Mathematic	12	40.0
	English	7	23.3
Control Group	**Category**	**Frequency**	**Percentage (%)**
Gender	Male	17	56.6
	Female	13	44.3
Interest in Subject	Malay Language	12	40.0
	Mathematic	13	43.3
	English	5	16.7

3.2. Comparison of cooperative learning and traditional learning on students achievement

Comparison of the effects of cooperative learning and traditional learning on student achievement is based on the pre-test and post-test. The results of the pre-test analysis are carried out by calculating the mean value and standard deviation. It was found that the mean for the cooperative group was 53.50 and the traditional group mean was 47.67. This shows the mean achievement of both classes before they receive the predetermined learning method is almost identical. The mean score and the standard deviation (SD) of the pre-test are shown in Table 2.

Table 2: Mean Score and Standard Deviation Test Based on the Pre-Learning Method.

Learning Methods	**N**	**Mean**	**SD**
Cooperative Learning	30	53.50	13.01
Traditional Learning	30	47.67	15.13

After a five-week learning period, post-test and data were analyzed. The findings showed an increase in the mean score for a cooperative group of 62.50 with the standard deviation of 11.57. Meanwhile, mean score for traditional group is 52.97 with standard deviation of 11.18. The mean score and the standard deviation of the achievement score according to the learning method are shown in Table 3.

Table 3: Mean Score and Standard deviation of Post-Test Based on Learning Method

Learning Methods	**N**	**Mean**	**SD**
Cooperative Learning	30	62.83	11.57
Traditional Learning	30	52.97	11.18

For hypothesis testing, (Ho^1: There is no significant difference between co-operative learning and traditional learning towards student achievement). An independent sample t-test analysis was used to compare mean increase scores between cooperative learning and traditional learning methods. The test shows that the value of $t = -3.346$, $p = 0.001 < 0.05$ is significant, as shown in Table 4. Thus, the null hypothesis, Ho^1 is rejected. The findings show that there are significant differences, namely marks that students exposed to cooperative learning showed higher achievement than students who attend traditional learning. This means that cooperative learning methods have a better effect on improving students' achievement in mathematical subjects for fractional topics.

Table 4: T-Test for Improving Achievement Scores Based on Learning Methods

Learning Methods	N	Mean	SD	t	Df	Sig.
Cooperative Learning	30	62.83	11.57	-3.346	58	0.001
Traditional Learning	30	52.97	11.18			

3.3 Comparison of the effects of cooperative learning and traditional learning towards students' interest

To compare the effects of cooperative learning methods and traditional learning methods towards interests, the hypotheses are expressed as (Ho^2: There is no significant difference between cooperative learning methods and traditional learning towards students' interest). The data analysis showed that the students 'interest in the experimental group was 3.95 with the standard deviation of 0.17, while for the control group that followed the traditional learning, the students' interest was lower compared to the cooperative group, namely 3.59 with the standard deviation of 0.31. Table 5 shows the mean and standard deviation of students' interest in learning.

Table 5: Mean and Standard Deviation of Students' Interest Based on Learning Methods

Learning Methods	N	Mean	SD
Cooperative Learning	30	3.95	0.17
Traditional Learning	30	3.59	0.31

For hypothesis testing, an independent sample t-test analysis was used to compare the mean interest between the group of students exposed by the cooperative learning method and the group of students who followed traditional learning. The test gives a value of t = -5.481, with a value of p = 0.00 <0.05 is significant, as shown in Table 6. Thus, the null hypothesis, Ho^2 is rejected. The analysis of this study showed that students exposed to cooperative learning showed higher interest in fractional topics than those who followed traditional learning.

Table 6: T-Test for Mean of Interest Based on Learning Method

Learning Methods	N	Mean	SD	t	Df	Sig.
Cooperative Learning	30	3.95	0.17	-5.481	58	0.000
Traditional Learning	30	3.59	0.31			

3.4 Comparison of the impact of cooperative learning and traditional learning towards student motivation

To compare the effects of cooperative learning methods and traditional learning methods on motivation, hypotheses are expressed as (Ho^3: There is no significant difference between cooperative learning methods and traditional learning towards student motivation). Data analysis showed that the motivational mean of the experimental group students revealed cooperative learning was 3.94 with the standard deviation of 0.15. Meanwhile, for the control group that follows traditional learning, the mean of student motivation was 3.64 with the standard deviation value of 0.18 lower than the cooperative group. Table 7 shows the mean analysis, standard deviation and t-test for hypothesis testing of cooperative learning effect towards student motivation. The findings show that the value of t = -6.83 with the value of p = 0.000 <0.005 is significant, Ho^3 is rejected. This shows that there is a significant difference that the effect of cooperative learning leads to motivate students in learning.

Table 7: Analysis of Student Motivation for Cooperative and Traditional Groups

Learning Methods	N	Mean	SD	t	Df	Sig.
Cooperative Learning	30	3.94	0.15	-6.83	88	0.000
Traditional Method	30	3.64	0.18			

3.5 Perceptions of cooperative group students on cooperative learning.

Students' perceptions of their experience in cooperative learning, on average, show a positive perception. This has a positive impact in the framework of cooperative learning implementation in the classroom. Table 8 shows the priorities of consent of 10 statements relating to experience in cooperative learning classes. The top five responses were the statement "I can talk and exchange opinions with my friends without fear" (23.4%), followed by the statement "I can make friends a place to ask" (16.7%) and so on, "I'm happy to learn in groups from learning alone "(13.3%) onwards" I feel quick to understand fractional topics when partner explained "(10.0%) and" I'm not afraid of making mistakes "(10.0%).

Table 8: Percentage of Consent Relating to Cooperative Learning

Item	Consent Statement	Percentage (%)
1	I can talk and exchange opinions with my friends without fear	23.4

2	I can make my friends a place to ask	16.7
3	I enjoyed studying in groups rather than studying alone	13.3
4	I feel quicker to understand the fractional topics when a friend explains	10.0
5	I'm not afraid when making mistake	10.0
6	I'm excited and motivated to be in the group	10.0
7	I do not like to study with friends	6.7
8	I do not understand because I cannot communicate	3.3
9	I think the discussion is not focused	3.3
10	My friends do not want to work together	3.3
	Total	100.0

4. DISCUSSION

Based on the statistical hypothesis, it can be concluded that there is a significant positive effect on the use of cooperative learning approaches by using jigsaw structures that can improve students' achievement, interest and motivation towards mathematical learning on Fractional topics compared to traditional methods. In terms of pedagogy, the development of education now requires a teaching approach that focuses more on student engagement. Teaching knowledge by teachers is usually one-way. Johnson et al. (1993) pointed out that as educators, we must change the paradigm of education in schools. Students should be actively involved in the classroom. Although traditional teaching plays its role, however, the problems of learning that have existed for some time have yet to be resolved.

From the aspect of interest and attitude, Rokiah and Maslina (1998) found a question about the negative attitudes of students towards mathematics. Since mathematics is a very important subject, there is concern among students in school. This is stated in the Jemaah Nazir Persekutuan/Inspectorate School (1992) report, which mentioned the negative attitude of primary school students on mathematical subjects. In the study by Zakaria and Habib. (2006) found that students think mathematics is a subject that most elusive when compared to other subjects. Failures and mistakes often occur when doing mathematical exercises. All these problems encourage researchers to look at aspects that can change the situation. The findings of previous studies show that cooperative learning can improve problem solving skills, especially the fractional topics focused on this study. According to Noraini (2005), active groups working together will help each other to solve the problem and the solution to the problem will be faster and more accurate. Through further analysis, it was found that students of cooperative groups and traditional groups were quite different in terms of understanding in solving mathematical questions. Johnson and Johnson (1990) argue that discussions in solving mathematical problems with colleagues can help increase students' understanding of a topic learned to solve mathematical problems. In addition, Razali et al., (2016) argue that traditional learning does not give students the opportunity to think critically and also discourage students from developing skills in solving problems, especially mathematics.

Factors leading to the success of cooperative learning can be associated with the theory of Vygotsky (1978) on the zone of proximal development, which is the implication of a student collaboration with peers who are more capable to solve difficult and complex problems. Cooperative learning can help a person to be a good problem solver because through discussions, one gets multiple perspectives from various angles to solve a mathematical problem.

4.1. The effects of cooperative learning methods to improve student achievement

In line with the objectives, the findings have shown an increase in the experimental group achievement that has been revealed by cooperative learning methods compared with the control group students who still use traditional methods. This supports the findings of previous studies involving Mathematics subjects conducted internally by Meriam (1997), Accounting subjects by Suhaida (2002) and General Paper subjects by Subadra (2005). The three findings show that cooperative learning methods can improve student achievement. The findings are also in line with Slavin (1995) argue that cooperative learning is a structured and systematic approach that can be used at any school level and suitable for any subject. Cooperative learning is very suitable to be implemented in teaching and learning as in the interaction, there is a change in the student cognitive. This is in line with cognitive learning theory stating that in order to keep information in mind, there must be a restructuring process or cognitive explanation for learning materials (Zakaria & Iksan, 2007; Slavin 1995). One of the ways to help cognitive explanations is to explain or teach others. Cognitive learning theories also suggest when students talk about learning materials, they are able to master the difficult concepts. Through peer guidance, the achievement of low-skill students can be improved. Therefore, cooperative learning can improve student achievement.

Students stated that cooperative learning can improve their understanding and mathematical achievement. In addition, they stated that cooperative learning allows them to discuss, share and exchange opinions to strengthen their understanding. This is in contrast to the traditional way in which students are less interact and only receive

information through one-way. From the discussion on the above findings, it can be concluded that there is an increase in the achievement of students exposed through cooperative learning as opposed to groups of students who follow traditional learning in accordance with the learning theories and also the studies conducted by previous researchers (Zakaria et al., 2013; Mahamod and Somasundram, 2017))

4.2. The effect of cooperative learning methods towards students' interest and motivation

Based on the findings of the study, the effect of cooperative learning methods increases the interest and motivation of students. The findings also showed that students' interest and motivation are very significant for those taught in co-operative learning methods compared to traditional methods. The elements in cooperative learning attempt to make students more motivated and interested in learning based on social interconnected theory (Johnson et al. 1998). Based on this theory, cooperative learning is said to create a positive dependence among students within a group to achieve the group's goals. Dependent positively is illustrated through the collaboration of fellow students who encourage interaction within a small group of students. The situation encourages students to become more motivated and interested in learning.

Students' interest in mathematics is high for cooperative groups compared to traditional groups. This shows that cooperative learning has always kept the student's interest at a positive level. This may also be related to the positive attitude of the student towards mathematical learning using cooperative methods. To some extent, the cooperative learning applied among these students inspires students' new attitude towards mathematics by changing their paradigms and perceptions of those who consider mathematics as a very difficult subject.

The increased performance of the group of students exposed by the cooperative method shows that students have been through effective learning. This is an element that has created a positive attitude change among students. One of the fundamental principles in cooperative learning is face-to-face interaction among group members (Johnson & Johnson 1990). Face-to-face interactions provide opportunities for group members to encourage less-skilled group members to work hard. In summary, a cooperative approach in learning fractional topics for fifth year students can increase the interest and motivation that drives towards the positive attitude of the students.

4.3. Perceptions of students on cooperative learning

The discussion further focuses on student perceptions on cooperative learning. The findings show that students love co-operative learning because they allow them to discuss, share and exchange opinions. They also agree that cooperative learning can also help them strengthen understanding, seek help from friends, solve problems quickly, identify mistakes and think in groups. Students also say that this cooperative learning can avoid getting bored when learning mathematics and giving them additional motivation to be more successful. This finding is consistent with the study by Zahara and Suzela (2011), which found that students exposed by this cooperative learning method have a positive attitude towards the lesson. Furthermore, the findings of this study support the findings of Juriah (2002), stating that apart from having a positive outlook on cooperative learning, students also stated that cooperative learning is a good way for them to learn mathematics. The findings of this study can help explain why cooperative learning has a positive impact on achievement, interest and motivation as well as encourage positive attitude among students when studying mathematics.

5. CONCLUSION

The findings of this study have implications on the teaching and learning methodology of teachers. There are various approaches that can be revealed to the student in order to increase interest and motivation that lead to a positive attitude. Therefore, as a final conclusion, it can be concluded that the effects of cooperative learning provides significant value to increase student achievement. Cooperative learning also has a positive impact on students' interest and motivation towards mathematics subjects in the "Fractional" topic compared to traditional methods. Students' perceptions of cooperative learning in teaching activities also have a positive impact on the students. Positive exposure received by students in cooperative learning and skills that are available will provide huge benefits in facing a more challenging future. It should be noted that cooperative learning is not "a medicine" of all learning and teaching problems. It is simply a tool used for teaching and learning purposes. What is more important is that students gain knowledge and skills to be individuals who are competent, capable and useful to the nation and country.

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